THE AUDIO LEAGUE REPORT

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NOTICE OF PRICE CHANGE

Effective October 1, 1955, the price of the Audio League Report was increased to $4. for 12 issues, $7. for 24 issues, $9. for 36 issues, and $3. for each additional 12 issues on group subscriptions. Lifetime subscriptions $50. The new price covers back issues, current issues and future issues for either a single subscription or a group subscription. If your subscription expires soon (see page 12) you may still take advantage of our old rate on your renewal, -if postmarked before November 15 (Renewals only at $3. for 12 issues, $6. for 24, $7.50 for 36).

Trial subscribers must pay the new rates. Effective December 1, our Trial rate will be $1.00 for 2 issues.

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THE PROBLEM OF EVALUATING LOUDSPEAKERS

It is possible to measure the performance of amplifiers, tuners, and even pickup cartridges by means of reliable, reproducible laboratory measurements. The correlation between laboratory measurements and listening appraisal is excellent. It is usually possible to state quite definitely that item "A" is superior to item "B", at least insofar as some particular characteristic is concerned.

In our past reports on audio components, we have not refrained from calling a spade a spade, and frequently have been highly critical of various aspects of the devices we've tested. However, when we are confronted with the task of saying "Speaker A is better than speaker B or worse than speaker C", or even "Speaker A is wonderful, Speaker B is no good ...", we find it necessary to adopt a radically different approach to our method of reporting.

With rare exceptions, it is not possible to categorically state that one speaker is nearly perfect or another is not worthy of consideration. Some of the factors which must be considered in evaluating a speaker are: size, cost, appearance, associated equipment (pickup, amplifier, etc.) and the listening habits of the user.

Even when the size and cost of a speaker system have been determined, there are usually a number of speakers within the same size or cost bracket. We have received numerous inquiries from our readers asking whether speaker A or speaker B is to be preferred, where A and B are competitive with each other. We cannot give an unequivocal reply to such a question. Even among our staff there are likely to be wide divergences of opinion on such matters. The only way to decide such a question is to listen to both A and B yourself. The comparison must be in what we call an A-B fashion. This means that the listener must switch instantly, or with no more than a few seconds delay, from one speaker to the other, maintaining the volume at the same level. In many showrooms, there is no provision for adjusting the relative volume levels, with the result that the more efficient speaker, being the louder one, will have an unfair advantage.

The person who does not have access to a sound comparator showroom must rely on manufacturers' claims or the opinion of someone whom he considers a qualified expert. The former are usually worthless, since every manufacturer will claim his product is the best. The hi-fi industry is replete with "experts", each with his own individual prejudices and preferences. Which one should the prospective purchaser believe?

We of the Audio League staff do not proclaim ourselves as "experts" on loudspeakers. We do consider that our laboratory measurements and listening evaluations are at least as valid as anyone else's, and more so than most. Our regular readers are familiar with the objective nature of our reports. We intend to treat the subject of speaker performance with the same objectivity. We have no axe to grind, and are subject to no outside pressure other than libel laws.

Our speaker reports will be clearly divided into two sections. In one we will try to describe how the system sounds and give our opinion of it. This is opinion, and is certainly subject to argument. In the other, we will present response curves, distortion data, oscillograms, etc. which are taken under controlled and reproducible conditions. We will discuss the limitations of our measurements, and comment briefly on the test data. This data we present as fact.

The Audio League vouches for the accuracy of the data presented in this section, within the limitations of our test procedure, and stands ready to back up its statements. The technically trained audiophile will usually be able to formulate a pretty fair picture of a speaker system's capabilities from our test data.

One more point is worth mentioning now. We have no intention of trying to rate a particular speaker by itself. Due to the vital contribution of the enclosure, our tests will always apply to a specific speaker and enclosure. In general, we will not extrapolate from the test data and try to rate a given enclosure with speakers other than the ones we test in it, unless it has characteristics which lead us to conclude that its performance is relatively independent of the speaker in it. It should be obvious from the multiplicity of speakers and enclosures on the market that we can only test a minute fraction of the possible combinations. Whenever possible, we will try to report on complete speaker systems.

THE KARLSON SPEAKER ENCLOSURE

PART I - GENERAL DISCUSSION AND SUBJECTIVE APPRAISAL

The Audio League regularly receives requests for reports on specific items. These requests are filed and periodically tabulated to help plan our future test program. Our readers have shown more interest in the Karlson enclosure than in any other single piece of equipment, by a wide margin. We, ourselves, were curious, having heard it only at Audio Fairs, where conditions for evaluating performance were far from ideal. Therefore, we obtained from Karlson Associates a 15" and a 12" enclosure assembled, but unfinished, and proceeded to live with them and measure their performance over a period of several months.

The Karlson enclosure made its first public appearance about three years ago. It was heralded as a revolutionary design, capable of coupling to

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the air efficiently at frequencies of 20 cycles or lower, with remarkable flatness of response and wide polar distribution. An article by John Karlson in Radio & Television News for January, 1954, presented his explanation of the principles of operation of the enclosure, together with constructional data and a series of curves purporting to show the superior performance of his enclosure.

Karlson Associates has printed up an attractive and informative booklet which contains their catalog and construction data on the enclosures, as well as reprints of articles dealing with its theory of operation. It makes good reading and we recommend it to anyone having even a casual interest in the Karlson.

Karlson listed several important and desirable features of an acoustic coupler (which is another way of saying "speaker system"). These were (1) flat response over the 20-20,000 cycle range; (2) accurate tonal phasing; (3) optimum transient response; and (4) omnidirectional radiation pattern over the entire frequency range. The first three are actually satisfied by the first requirement. A speaker system having flat response over the audio range will intrinsically possess optimum transient response and minimum phase errors. We agree with Mr. Karlson on the importance of these factors, though we would add a fifth, which in our opinion should rate near the top of the list: low distortion over the entire audible range. Later in his article Mr. Karlson does refer to this characteristic as a property of his enclosure.

The original Karlson was designed for 15" speakers but adaptor boards were made available to permit the use of 12" and 10" speakers. The 15" enclosure is a modest sized rectangular box of pleasing proportions (34½"H x 22½"W x 18"D). Its most obvious feature is the tapered exponential front opening, only ½" wide at the top and extending the full width of the enclosure at the bottom. The speaker mounts at the bottom, facing upward at almost a 30° angle from the vertical.

The interior of the box may be considered as divided into four cavities or resonant chambers. The volume back of the speaker is coupled to the upper rear portion of the box via a slot a few inches wide extending the width of the box. Both rear cavities contain a certain amount of damping or sound-absorbing pads whose size and position are claimed to be fairly critical.

A vertical partition divides the top front and top rear cavities, with coupling between them effected through a port. This port is behind the upper or narrow portion of the exponential front opening. A board extends horizontally across the middle of the enclosure, with its rear edge and the back panel forming the slot referred to earlier. It extends forward of the vertical partition to divide the front half of the box into upper and lower cavities coupled through a slot roughly the same size as the rear slot. The speaker radiates directly into the lower front cavity, where the front opening is wide and does not appreciably block direct radiation of highs.

In discussing the construction of anything as complex as the Karlson enclosure, a picture is worth ten thousand words. We can't take any of our limited space for pictures, but urge the interested reader to read the Karlson booklet.

As we have noted elsewhere in this issue, we shall separate the technical section of our report from the subjective evaluation. The portion immediately following will attempt to describe how it sounded to us in our listening tests.

Several speakers were used in the 15" Karlson. Most listening was done with an Altec 604. The high frequency portion of this speaker is not up to that of its successor, the 604C, and to convince ourselves that we were not handicapping the enclosure with an inferior speaker, we also used a Jim Lansing D-130. This model has been used very successfully in their enclosures, according to Karlson. Finally, a 12" G.E. S-1201D was used, with an adaptor plate.

Listening environment varied from a large fairly "live" room of about 7700 cubic feet, to a typical living room of 2700 cubic feet. Some outdoor listening was also done. A second enclosure, in another living room (quite "live") was used for listening only, with an Altec 602A speaker.

It would be well to review our early impressions of the Karlson, based on listening to it at several Audio Fairs. At such demonstrations, it is customarily played at high levels with "demonstration" records containing a preponderance of percussion and massed instrumental works. Also, the speakers used in Karlson demonstrations are naturally of the best, such as the Jensen G-610 and Stephen 206AX.

The results were undeniably impressive. We came away convinced that (a) the Karlson could put out a tremendous sound level, and (b) They reproduced drums with devastating effect. Still, we had lingering doubts about their ability to handle other instruments, at more normal listening levels.

The next phase was a period of several hours spent listening critically to a Karlson Altec 602A combination in a home environment. Many records were played with which we were familiar from repeated listening on other systems. This time the listening levels were quite low, in the interest of peaceful coexistence with one's neighbors! Our initial impression was that the sound was "distant" or "contained". The effect was much as if the listener were sitting toward the rear of the concert hall. All the sound appeared to come from behind the exponential slot of the enclosure. This is in sharp contrast to the characteristic of the Klipsch "K" horn and its relatives, which have a broad, diffused sound source appearing to originate right in the room with the listener.

Nevertheless, closing one's eyes produces the startling illusion of actually being in the concert hall when listening to the Karlson with certain types of music. Regardless of whether one preferred close-up or distant sound, the sense of realism was unmistakeable. One thing was immediately obvious: the Karlson's performance held up just as well at a whisper as at the highest volume levels. The bass was very much in evidence at very low levels, dispelling the unwarranted feeling held by some that the Karlson had to be played loud for good bass response.

We came away from that listening session convinced that the Karlson had a unique and, in many ways, impressive quality, but not all convinced that we liked it!

Shortly afterward, we obtained our test enclosures and commenced a more thorough and systematic investigation. At first we used the Altec 604, driven by a 50-watt McIntosh amplifier, in the large listening room. Here we were able to use tremendous sound levels, at times approaching the threshold of pain. The effect when playing organ and choral works was overpowering. At more moderate levels, the consensus of our listening panel was that the lows and highs were present in full measure, but that something was

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amiss in the mid-frequencies. No one could actually define what was wrong, but practically all who heard it expressed some reservations about the mid-frequency reproduction.

We used this speaker in homes for some time, driving it with a Williamson amplifier and later with a good quality commercial 25-watt amplifier. We frequently compared it to other systems which were being tested. There can be no doubt that a Karlson has a very distinctive sound quality. It is as easy to pick it out blindfolded from a group of speakers as it is to spot a Klipsch type system. As we stated previously, they have completely opposite properties as far as presence and width of sound source are concerned.

Karlson emphasizes that his system is a point source of sound, and states that because of this, the definition of individual parts of an orchestral passage is greatly enhanced. We have no evidence on whether or not it actually is a point source and are not convinced that this would necessarily be desirable. We have never heard an orchestra or any other instrumental group which acted as a point source of sound. A solo human voice is the nearest approach to a point source that we can think of, and we will shortly comment on the Karlson's reproduction of voices.

At any rate, the apparent definition of complex sound reproduced by a Karlson is very good, whatever the reason. In connection with this, Karlson attributes the point source effect to the use of a coaxial speaker, plus implying that the slot in the front of the enclosure adds to the effect. We can't offer any solid data on this, though we have a feeling that the Karlson does give a more pronounced point source effect (what we would describe as listening through a hole in the wall) than the same speaker would give in another type of baffle. As to whether this effect is desirable - well, we think Mr. Karlson has an argument on his hands. Obviously he thinks it is - and equally obviously the thousands who use Klipsch K-type horns, multiple speaker systems, and other broad sound sources, think it isn't. Take your choice.

The same matter of opinion enters into judging Karlson's statement that 2 or 3-way speaker systems, other than coaxial, are undesirable from a phasing standpoint. We've heard reproduction ranging from magnificent to execrable on both types of speaker systems, and are inclined to take a more lenient view than Mr. Karlson. Each speaker system should be judged on its sound only, without considering its internal structure.

We found the reproduction of chamber works to be generally satisfactory with the Karlson. The "boxy" sound was not in evidence and all listeners considered the overall effect pleasing, though not entirely without reservation.

The results were more variable with orchestral and symphonic music. At times the extremely realistic effect of being in the back of the concert hall was present. At other times, a definite coloration of the mid-frequencies occurred, which most listeners found disconcerting.

This would be an appropriate time to elaborate on our interpretaion of "coloration". It is commonly used to describe a modification of reproduced sound which makes it sound unnatural. A little thought will show that all speakers color sound. The only uncolored sound would be that which is indistinguishable from the original live performance. Except for a very few cases involving solo instruments, we've never heard anything even approaching this ideal state. "Coloration" should not be a bogey for speaker manufacturers, but due to the advertising claims of some who deny that their product colors sound, the rest are disturbed by the mere mention of the word. Even speakers with extreme flatness of response and low distortion cannot deceive the listener into thinking he has an orchestra in his living room, but we don't feel that this indicates an inferior speaker system.

To get back to the Karlson - the mid-frequencies sound distinctly different than they do on any other speaker system we've heard. The result, in our opinion, is a loss of naturalism. To Mr. Karlson's ear the effect is doubtless most pleasing. To the prospective user of a Karlson, this underscores the need for listening critically before buying, if at all possible.

The picture is not as black as our account would paint it. Firstly, this mid-range effect is not always in evidence. Secondly, after a day or two of living with the Karlson, one becomes accustomed to its characteristics and is not aware of anything out of the ordinary.

A strong compensation for any mid-range deficiencies is the solid, non-boomy bass. Here the Karlson stands out from the ordinary bass-reflex box. It is all too common for the latter to produce a tubby or boomy bass. When correctly designed and heavily constructed, and tuned for the individual speaker used in it, a bass reflex can be extremely good and not at all boomy. This condition is unfortunately extremely rare in practice. By contrast, the Karlsons do not boom, whatever speaker is used in them. They have plenty of bass, without tubbiness.

The curves in the technical section of this report show clearly the bass performance of the Karlsons. They are not the ultimate in this respect but do a most creditable job.

Our tests show that the low and middle frequency performance of a 15" Karlson, from perhaps 40 cycles to over 1000 cycles, is virtually independent of the speaker used in it. Below 40 cycles, bigger and better speakers will enable more fundamental energy to be generated; that is, they will have less distortion.

It has been claimed that the Karlsons "soak-up" the highs in their front cavity. Even the Karlson people caution kit constructors to thoroughly varnish the inside of the front cavity to prevent loss of highs. Our test units (factory assembled) seemed to have all the highs one could want. We made no measurements of high frequency response, but many hours of listening convinced us that the Karlson had no weakness in that department.

We found little audible evidence of the 120° high frequency dispersion claimed for the Karlson. High frequency beaming was very much in evidence with the GE S-1201D (which has very sharply beamed highs) and considerably less so with the Altec and Jim Lansing speakers. It sounded to us as if the Karlson's high frequency dispersion is no better or worse than that of the speaker used in it.

In overall sound, we found the Jim Lansing D-130 to be the best of the speakers we tried in the Karlson. The Altec 604 was second, with the GE S-1201D giving it a close race. This was one of the most surprising discoveries we made in testing the Karlson. An inexpensive speaker such as the $20. G.E. or any of a number of others, can match or possibly even out-perform a much more expensive speaker in the Karlson. Part of the explanation for this can be found in the previously noted fact that from 40 to over 1000 cycles the Karlson's performance is nearly independent of the speaker. In the rare instances where substantial response below 40 cycles is needed, the better speakers will have a clear advantage. The more expensive coaxial speakers

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with extended highs will doubtless sound best on the high end. None of the three speakers we used is noteworthy for extended or brilliant highs; therefore any differences between them might be expected to be minor. So they were.

The structure of the Karlson is such that its sides, top, and bottom are well-braced and extremely rigid, as is desirable in a speaker enclosure. The front "wings" and the back panel, both subject to tremendous sound pressure, are not too well braced and show considerable vibration. We tried stiffening the back panel with 2x4 lumber, without any significant change in performance.

Earlier, we mentioned the reproduction of voices on the Karlson. We have found very few speaker systems which can reproduce the male voice in a natural manner. Most bass reflex boxes and back-loaded corner horns have a boomy quality caused by resonances in the 60-120 cycle region. These resonances are excited by the lower fundamentals of many male voices, giving them an unnatural, boomy quality. The Karlson is quite free of any resonances in this region, but its peculiarities manifest themselves at a higher frequency (see the technical section of this report). As a result, male voices sound boxy - almost nasal at times. There is no boom. as to whether the lesser of the two evils is the bass-reflex boom or the Karlson boxiness, we are undecided. Neither is really serious, but the presence of either characteristic hinders the illusion of realism which we all strive for.

A most worthwhile feature of the Karlson enclosure is the fact that it does not depend on corner placement for its bass performance. As with any speaker system, a corner location will improve its extreme low frequency output (below 50 cycles or so) by a few db. For all practical purposes, a flat wall makes a satisfactory backdrop for the Karlson. In fact, during our outdoor tests, we located it in an open field and were able to massage the soles of our feet from the ground vibration within a 15-foot radius around the box. This was at frequencies from 35 to 150 cycles, with power inputs of less than 10 watts to the Altec 604.

THE KARLSON 12

Last year, a smaller version of the Karlson, designed for 12" speakers, made its appearance. This compact enclosure, looking like a scaled down 15" Karlson, 24-3/4"H x 16-3/4"W x 13-3/4"D, was demonstrated with a number of fairly expensive speakers at last year's Audio Fair in New York. Unfortunately, we were unable to test our unit with any of these speakers, but we did give it a fair chance with the GE S-1201D, E-V SP12B, University 6201, and EV SP-8BT (with a homemade adaptor plate).

In general, our comments on the 15" Karlson apply equally well to the 12" unit. Its internal construction is generally similar to that of the larger box, plus adjustable slot widths on two of the slots coupling the internal chambers. These are supposed to control brilliance and damping. We didn't try adjusting them, for reasons which will be apparent when our laboratory test data is examined.

As far as low frequency response is concerned, the 12" and 15" Karlsons are practically identical. A given 12" speaker will go down as low in the 12" box as in the 15" box. The high frequency response is apparently the same in both sizes. Is there a difference, then? Most certainly - the overall sound of the Karlson 12 was judged markedly inferior to that of the Karlson 15. The middles are mixed up again, but the difficulty has been moved higher in frequency due to the reduced dimensions of the box.

Once again, we have two powerful redeeming features to consider. The little SP8BT, for which the Karlson 12 was surely never designed, was the star performer. Its lower limit (about 50 cycles) was not quite as far down as its 12" rivals, but its overall sound was very pleasant and natural. In an A-B Comparison with an E-V Aristocrat/12TRXB combination, the Karlson 12/SP8BT was unanimously voted the winner. On piano music, the Karlson sounded far more natural, and in our opinion was generally superior. In comparison with the SP8BT in a Baronet (a small back-loaded corner horn about the size of the Karlson 12), it was found that the Baronet reached down a few more cycles into the bass, but had a slight tendency to boom at 100 cycles. Nothaving any such resonance, the Karlson had a more pleasing low end response.

In case anyone is wondering how we reconcile our criticism of the Karlson mid-frequency performance with our praise of its natural sound - we don't! We are merely reporting our impressions of what we heard.

The second redeeming feature of the Karlson 12 is its ability to operate lying on its back. Actually, the 15" Karlson can be operated in this position also, but its size makes it too clumsy to use this way, in most homes. The little Karlson can fit into many living rooms with its front panel horizontal and the apex of the slot pointing at the wall. When lying in this position, the highs are beamed at a point about 5' up on the wall, from which they are reflected and scattered throughout the room. The middles and lows fill the room without any pronounced directional effect. The overall result is as though the music were radiating from the entire wall, with the highs in particular originating from a point several feet high, behind the wall.

This effect must be heard to be appreciated. It is as though the wall were a sound-transparent curtain across the front of a stage. It is difficult to localize the sound source. One is no longer aware of any mid-range deficiences. Perhaps they are still there, but the remarkable breadth of the sound source seems to mask them. Please note, however, that this type of operation is the exact opposite of the point source sound effect which Mr. Karlson believes to be so desirable.

PART II- TECHNICAL REPORT AND RESPONSE CURVES

Figure 1 shows frequency response, harmonic distortion and impedance curves of the 15" Karlson with the Altec 604 and the Jim Lansing D-130 speakers. The impedance curve shown is for the 604 only. Power input to both speakers was set at 0.5 watt at 100 cycles and the voltage across the speaker was held constant at that value. Mike to speaker distance was 6 ft. on axis.

The response curves show fundamental output only. For example, if 50% harmonic distortion was measured at a certain frequency, the total sound level reading was reduced by 3 db before being plotted. When distortions approach 100%, the output falls abruptly. It appears that below a certain frequency, in the vicinity of 25 cycles, no fundamental output can be obtained. This is not strictly true. By placing the microphone very close to the speaker, or at the apex of the exponential slot, we were able to develop 16 cycles with distortions not exceeding 50%. Unfortunately this occurred at sound levels of the order of 60-65 db, which are much too low to be heard or felt. Attempts to increase the level merely increased the distortion. No doubt a speaker with ½" of cone travel

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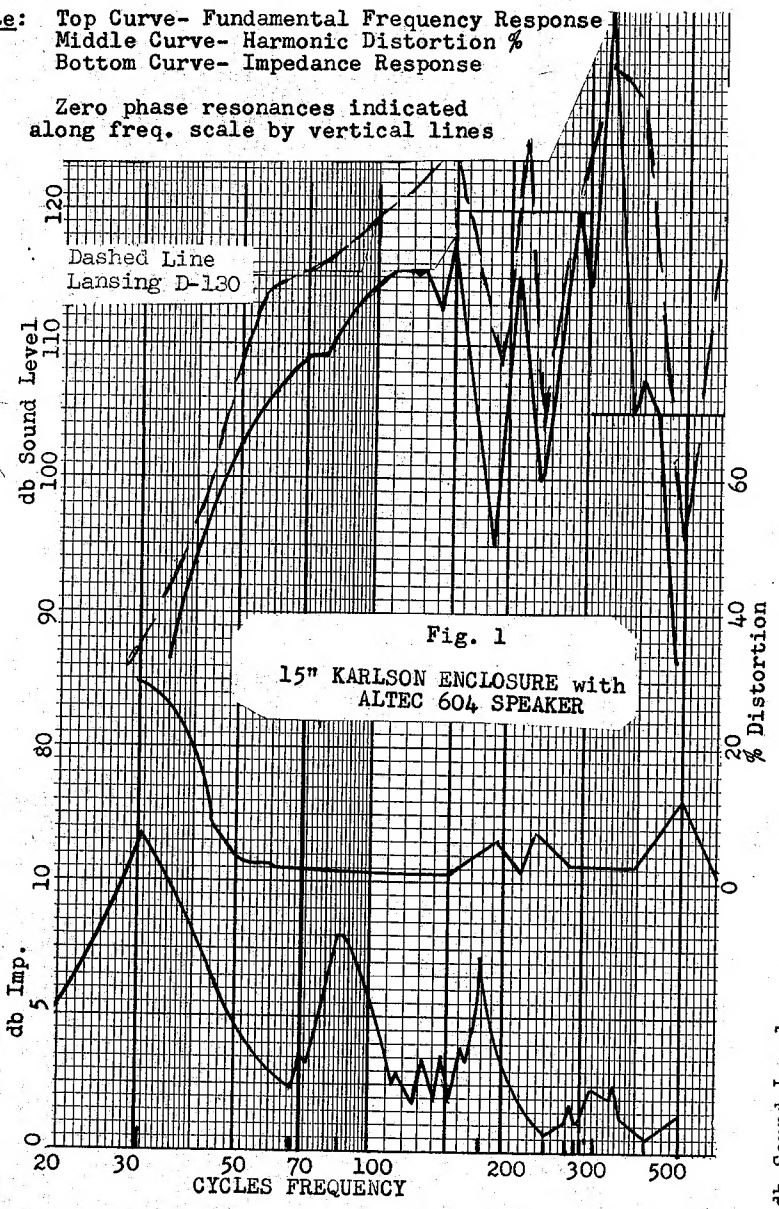

Fig. 1

15" KARLSON ENCLOSURE with ALTEC 604 SPEAKER

could produce more substantial amounts of 16 cycle fundamental, but our speakers just weren't equal to the task!

It is immediately apparent from Fig. 1 that the response is (a) extremely jagged from 150 cycles up; and (b) independent of which speaker we used. The sharp dips are easily correlated with impedance peaks. We first suspected resonances in the wings or back panel (which vibrated fiercely at these frequencies) but subsequent investigation convinced us that the roughness was due to internal cavity resonances and cancellation of front cone radiation by the rear radiation.

From these curves one might draw rather pessimistic conclusions about the value of the Karlson enclosure. We are happy to say that this is a perfect example of the danger of evaluating speakers by examination of their response curves. The Karlson actually sounds much better than these response curves would lead one to expect. It is easy to see where that mid-range boxiness comes from, though!

Nevertheless, it is hard to reconcile the sort of data we obtained with the performance claimed for the Karlson by its makers. In reading the reprints of John Karlson's articles on the principles of his enclosure, we found a couple of places where we take issue with him.

He shows an impedance curve of a typical speaker in a Karlson enclosure. It has a regular pattern of peaks and dips which he claims show a complete lack of mechanical resonance. To us it looks rather like a large number of resonances. Our impedance curves shown in Fig. 1 are quite similar to Karlson's published curves. They are studded with resonances, not all of which show up as acoustic variations, fortunately.

Then Mr. Karlson shows the calculated impedance curve of a large exponential horn which bears a superficial resemblance to the preceding curve. From this similarity, he concludes that his enclosure is acoustically equivalent to this gigantic horn, over 31 feet long and 12 feet in mouth diameter. We do not agree with his conclusions.

He then quotes Olson to the effect that an impedance variation of 6:1 is needed to produce a 2 db change in acoustical output. From this Karlson concludes that his speaker system is flat within 2 db from 20-20000 cycles, simply because his impedance variations are less than 6:1 over that range. The Audio League does not measure the frequency response of a speaker system by its impedance curve. We prefer to rely on the more conventional techniques of measuring acoustic output with a calibrated microphone. Fig. 1 tells its own story.

Later, a statement is made that "it is estimated that no more than 2% harmonic distortion occurs at 30 cycles in the Karlson enclosure". We don't know how that estimate was arrived at. We measured the distortion. It was 30-40% at a 0.5 watt level; not significantly greater with 10 watts input. Now, this is actually rather good performance. Speaker systems that will develop much less than 30% distortion at 30 cycles are few and far between. Our standard reference speaker system, the best we've ever seen, has about 5% distortion at 30 cycles.

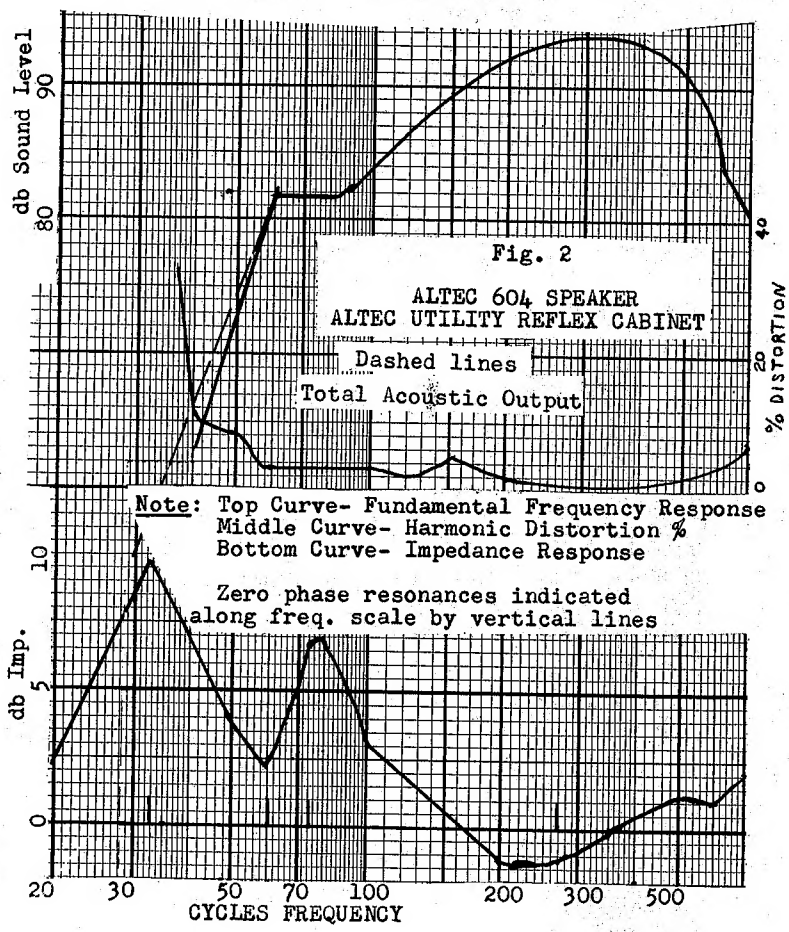

Fig. 2

ALTEC 604 SPEAKER
ALTEC UTILITY REFLEX CABINET

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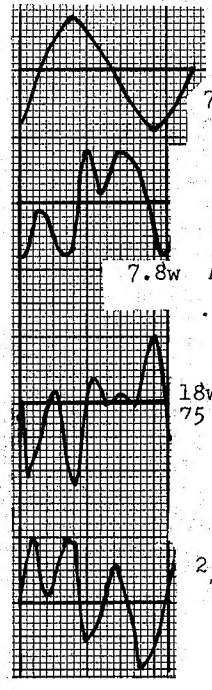
Karlson states that because his major impedance peaks are not harmonically related, no reinforcement of any harmonic distortion in a 30 cycle note occurs at the second harmonic frequency of 60 cycles or the third harmonic frequency of 90 cycles. Unfortunately, the resonances are sufficiently close to being harmonically related so that this is exactly what does happen!

Our oscilloscope photos (reproduced by tracings) in Fig. 5 show this rather unequivocally. Note the large amount of 3rd harmonic on the 30 cycle output of the Karlson/D-130. There's plenty of fundamental there, plus that 40% of predominantly 3rd harmonic distortion.

The Altec 604 used in much of our listening tests was installed in an Altec bass-reflex enclosure of the same approximate size as the Karlson. Fig. 2 shows the results of a full set of measurements made on it under the identical conditions employed in the Karlson measurements. Note that the bass response and low frequency cut-off of the Karlson are definitely superior to those of the bass reflex. The harmonic distortion of the latter is 80% at 30 cycles compared to 30% for the same speaker in the Karlson. On the other hand, the bass reflex does not show the jagged response above 150 cycles that the Karlson does. Its response is heading for a severe drop as we go above 500 cycles. We did not carry our tests far enough to determine if this was a cross-over cancellation in the 604 or due to some other cause. The important thing about this curve is its smoothness as compared to the Karlson's response. In listening quality, the Altec box was much more natural sounding on voice, quite free from "bass-reflex boom", but decidedly on the thin side in the region below 50 cycles compared to the Karlson. The scope photo in Fig. 5 indicates less harmonic distortion at 30 cycles with the speaker in the reflex box than in the Karlson. This might seem to be at variance with our distortion curves, but the circumstances of the two measurements are not comparable. The power inputs to the two speaker systems were quite different, as were their efficiencies.

Also shown in Fig. 5 is the acoustic output of our standard speaker system which was used as a check on our test procedures as well as for purposes of listening comparison.

Fig. 5
Acoustic Output at 30 CPS



7.5w - Our Reference Enclosure
75 db

7.8w Altec 604 in utility Enclosure
75 db

18w G.E. 12OlD
75 db Karlson 12

2.5w Jim Lansing D130
75 db Karlson 15

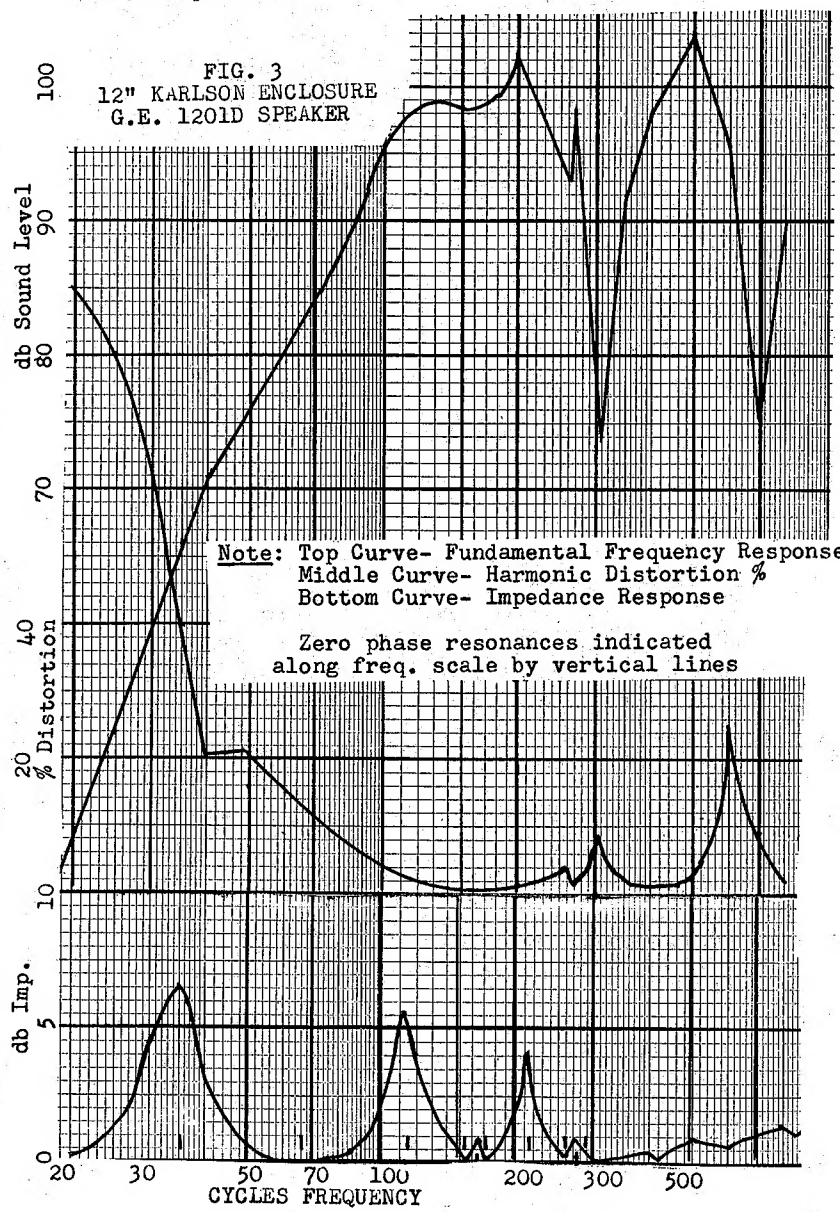
THE KARLSON 12

Fig. 3 shows the results of a full series of tests on a Karlson 12/G.E. S-1201D. The similarity of the response curves and impedance curves to its larger relative are unmistakable. Due to its smaller dimensions, the peaks and valleys are moved up about half an octave in frequency. This fact, together with a few other observations, convinced us that the ragged response of the Karlsons was definitely due to their internal cavity resonances and front-back cancellations rather than to any errors in our measuring technique. (Oh, yes - we doubted our measurements after the first run we made with the Karlson. All in all, we repeated them in 3 different locations, plus using a number of different speakers. The excellent repeatability convinced us that we were not at fault).

Observe that the low frequency response and distortion of the Karlson 12/G.E. S-1201D are actually superior to those of the 15" model below 30 cycles, though it does start to fall apart at 40 cycles and has substantially greater distortion from 40-100 cycles than the big Karlson. This is remarkable bass response from an inexpensive 12" speaker, especially in a box of this size.

An oscillogram of the 30 cycle acoustic output of this enclosure is shown in Fig. 5. Plenty of distortion, but a distinct amount of fundamental is present.

FIG. 3
12" KARLSON ENCLOSURE
G.E. 1201D SPEAKER



Note: Top Curve- Fundamental Frequency Response
Middle Curve- Harmonic Distortion %
Bottom Curve- Impedance Response

Zero phase resonances indicated along freq. scale by vertical lines

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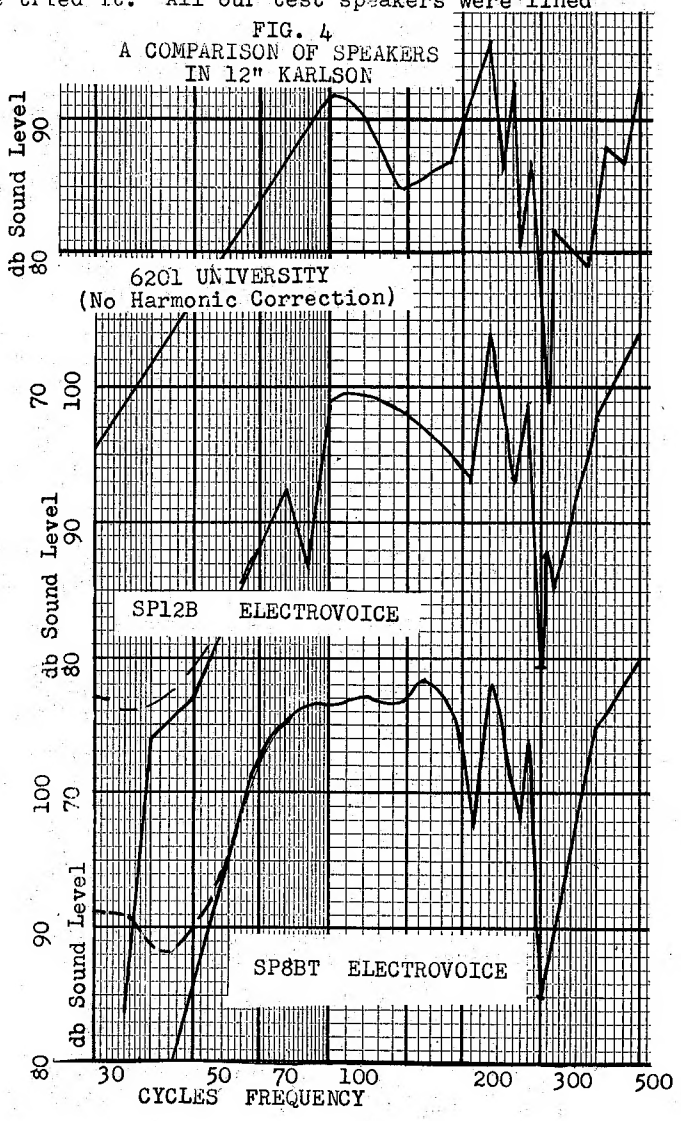
Fig. 4 shows frequency response curves only for several popular speakers in the Karlson 12. From 200-500 cycles, it obviously doesn't matter which speaker is used - the sound is the same. The University 6201 and E-V SP12B are quite similar in their response below 100 cycles as well. The E-V SP8BT (in our opinion one of the finest 8" speakers ever made, but unfortunately no longer available) for some unaccountable reason was much flatter and smoother below 200 cycles than any 12" speaker we tested. Listening tests confirmed this -- in fact, its superiority was first observed in listening tests and then was confirmed by our measurements.

The dashed line curves in Fig. 4 show the unweighted sound levels as read on our General Radio sound level meter. They make it appear that the output levels off or even rises at low frequencies. This is due to harmonic distortion. When corrected to show only the fundamental output, the solid line curves are the result. The 6201 is an exception -- we did not measure harmonic distortion on this speaker so the solid curve in that case represents unweighted sound output.

After obtaining the above data, we discussed it with Mr. Karlson, who gave us some information on his measurement techniques and suggested that we try a white noise listening comparison. He feels that this is one of the most powerful tools in evaluating loudspeaker performance.

Due to our limited experience in evaluating white noise by ear, we felt that we could not fairly report on such tests. Nevertheless, we tried it. All our test speakers were lined

FIG. 4
A COMPARISON OF SPEAKERS IN 12" KARLSON



up and fed 0.1 watt of interstation hiss from an FM tuner (one at a time, of course). The results were unequivocal. Each Karlson fairly whistled at its most severe peak (300 and 500 cycles for the 15" and 12" models, respectively). The bass reflex gave out a roar, with some emphasis on the cross-over frequency of the Altec 604, but little trace of a low frequency resonance. It showed less of the deep rumble which characterizes good bass response, and which the Karlsons had in good measure. Our reference speaker gave forth a smooth, silky hiss and an even, deep roar, consistent with its peak-free response.

The relative efficiency measurements we made at this time showed the following values (sound levels at 6 foot distance for 0.1 watts white noise input):

Karlson 15/D-130	-	82.5 db
Altec/604	-	84 db
Karlson 12/1201D	-	74 db

Whenever possible, in future speaker measurements, we will attempt to measure their efficiencies in the identical manner, so that the reader may make his own comparisons.

SUMMARY

Despite what may seem like damaging evidence against them, the Karlsons do merit serious consideration for a number of applications.

On the good side, they produce better bass response (below 150 cycles) than most non-corner enclosures and are superior to a great many corner horns. Mounted against a flat wall, they will out-perform most corner enclosures. Not everyone has a corner available, so this may be an important consideration.

The Karlsons are non-boomy. Their mid-range response is ragged, resulting in a "boxy" or "contained" sound. Their high frequency response is as good as that of the speaker used in them.

Their apparent bass response is even greater than their true bass response. They tend to reinforce harmonics falling in the 80-90 cycle region which makes them sound much heavier in the bottom than they should. The effect is not unpleasant, however.

They are quite attractive in appearance, and will blend with almost any decor. Their price, in kit form, is most reasonable. The 15" model is under $50. and the 12" model is under $40. The 15" Karlson is just about the "most enclosure" which that small sum will buy.

The Karlson gets more out of a low-priced speaker than most enclosures of comparable price. The 15" model (kit) plus a GE-1201D comes to under $70. and the results are remarkably close to what the $156. Altec 604 will do in the same enclosure (except on the high end, where the GE is not outstanding). Few $70. speaker systems can match this for performance or appearance.

By the same token, we cannot recommend either the finished Karlson 15 (almost $120.) or any expensive speaker in it. By the time one reaches the price brackets above $200. there are many other speaker systems which (to our ears) sound better than the Karlson with any speaker in it. Of course, if you have heard a Karlson with a particular speaker (even the $250. Jensen G-610) and like the sound, go ahead and buy it. The customer is always right in this business!

The 12" Karlson has little to recommend it except its size. If space is available, and you are considering the purchase of a Karlson, we'd suggest the 15" model. The price differential is very small. The 12" model does offer intriguing possibilities for developing the aural image behind the wall, if one is experimentally inclined.

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The only serious drawback to the Karlsons is the fact that they impose their own characteristic sound on any speaker used in them. Call it coloration or not, as you wish -- the fact remains that a Karlson sounds like nothing else but a Karlson, regardless of the speaker used.

We have received many letters from readers who own Karlsons. All are quite satisfied with them. The most common praise is of the tremendous bass performance. The most common criticism is of vibration of the wings or back panel. However, as the Karlson booklet states, it is futile to attempt to improve the performance of a Karlson by adding braces or stiffening members, as we tried and found out. All its deficiencies are inherent in its design rather than in its construction, which is far more solid than any competitively priced enclosure.

In our opinion, the Karlsons are not, in their present form, the revolutionary advance in acoustics that they are represented as being. Their design is ingenious, and might even be capable of refinement so that they may some day be almost as good as they are now claimed to be - which is mighty good!

★★ HELP STILL NEEDED ★★

If you are a manufacturer, distributor or dealer in High Fidelity equipment, you can now give your customers the best possible present, a subscription to the AUDIO LEAGUE REPORT. Write us about bulk quantity prices (100 or more copies) for sale or give-aways, or about soliciting subscribers via your mailing lists. It will not only help us and your customers but can be advantageous to you, as several dealers have already found.

★★ STATEMENT BY KARLSON ASSOCIATES, INC. ★★

The text of our report on the Karlson enclosures was submitted to Karlson Associates for their comments. The following statement, reproduced in its entirety, was received from John Karlson.

"I want to thank the Audio League for the many kind comments on our enclosure. A good deal of skepticism is also apparent in this report. However, we do not object to this attitude, since it has been our experience that these skeptics have very often become our most enthusiastic boosters.

"Many points were raised in this report which might be the subject of quite a harangue, both pro and con.

"One of the more important of these has a concluding statement, that the Karlson enclosure did not appear to be a very revolutionary development in spite of its admittedly unique design.

"All types of acoustic transducers can be regarded as special forms of simple pipes. If reference is made to the accompanying illustration, we can see that the horn, for example, is a pipe with the open end flaired out. Similarly, the drum or infinite baffle is a pipe with both ends closed, the Helmholtz resonator is a pipe with a bulging closed end. The three types of transducers or combinations thereof have formed the basis of design for all musical instruments and other man-made acoustic transducers (and enclosures) since the dawn of our civilization. Now we have a fourth type, the Karlson coupler, which is a pipe with a large tapered slot extending along its length. This basic form is again generic and there are literally thousands of special applications where its particular properties are useful.

"I realize that in this day and age, every minor development is prone to be called "revolutionary", "earth shaking", etc., etc., with the result that these terms are apt to lose their impact. However, in our instance, it seems that there is some justification for our claims. It would be interesting to learn the opinions of your readers on this point.

Continued on page 12

HOW THE AUDIO LEAGUE TESTS LOUDSPEAKERS

We believe that laboratory tests alone cannot define the performance of a speaker system in a satisfactory manner. Listening tests in a home environment, preferably in a side-by-side A-B comparison with one or two competitive speakers, are the only valid criteria for selection of a loudspeaker system. Even so, this method has its flaws. High quality program material must be used, superior to the capabilities of the speakers being tested. Volume levels of all speakers being compared must be equal. All types of program material must be used: symphonic, chamber music, vocals, choral works, percussion, etc.

It is still possible for a person not skilled in recognizing speaker deficiencies, or unaware of what constitutes superior reproduction, to make a choice which will leave him unhappy as his hi-fi experience grows. If he accepts the opinions of someone presumably more competent than himself to evaluate speakers, he may still fall short of his goal. Individual tastes vary widely when it comes to speaker preferences. It is for this reason that we freely admit that our subjective judgments may disagree drastically with an individual reader's opinion. In such cases, the reader is always right.

In order for us to have a more substantial basis for speaker evaluation than mere personal opinion, we perform certain laboratory tests. These are necessarily less complete than those performed by some speaker manufacturers. We don't have an anechoic chamber, automatic response plotting equipment, or the wide range microphones needed to measure tweeter performance.

Nevertheless, we believe our measurements are sufficiently complete to show whether one speaker has smoother response, lower distortion, better damping, or higher efficiency than another. In general, our response data will not agree with that offered by the manufacturer. This is no reflection on his integrity, or on ours. Unless the test conditions are rigidly defined as to speaker position, damping factor, and acoustic environment, it is not possible to closely reproduce someone else's test results. When these factors have been defined, it is possible to do so with remarkable fidelity. We know of only one manufacturer who specifies the test conditions for his loudspeaker system with sufficient detail to permit duplication of his results. Perhaps this policy will become more widespread in the future. Until that time, we must depend on measuring all systems under as nearly identical conditions as possible, and on using a standard speaker system of known high performance as a check on the validity of the measurements.

The Audio League performs the following tests on speaker systems:

1) Frequency response: The speaker is set up in an open field, far enough away from other objects to prevent reflections from influencing measurements. The pickup device (normally a General Radio 759-B sound level meter) is placed as nearly on the axis of the speaker as possible, and six feet in front of it.

   The speaker is driven from an amplifier whose distortion does not exceed a few tenths of a percent at the power levels involved. The damping factor is high (15 or greater) unless the speaker manufacturer calls for a specific value of D.F. to achieve optimum performance.

   The test signal is obtained from a low distortion audio oscillator (Hewlett-Packard 201B). Harmonic content of the signal driving the speaker is checked with a distortion meter and is normally under 0.3%.

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Readings of sound level are taken as the frequency is increased from 20 cycles up to about 1000 cycles. Below 100 cycles, readings are taken every 5 or 10 cycles; above this point readings are taken at each point of maximum or minimum output, as well as every 50 or 100 cycles.

The driving power for each speaker is adjusted to give a sound level of about 90 db (somewhat above normal listening levels) at 100 cycles. This power level is normally maintained constant throughout the test. Readings of power input to the speaker are made with the Heathkit AA-1 Audio Analyzer.

Certain folded horns will not deliver proper bass performance unless mounted in a corner. When testing these, an outdoor concrete corner is used. There is still some loss of low frequency performance since these speakers depend on the room walls to further extend their effective mouth area.

Normally, frequency response runs are also made in one or more typical living rooms. Since the results of such tests will not be directly applicable to other listening environments, they will not always be reported on fully. If some unusual circumstance requires it, we will include data taken on indoor measurements.

There are several reasons why we do not test response above 1000 cycles. The sound level meter is not reliable above 5000 cycles.

Above 1000 cycles, the sound level meter reading is extremely dependent on the proximity of other objects. A person moving even slightly, many feet from the speaker, can cause large errors. The response of many speakers we have tested shows considerable raggedness at frequencies above 1000 cycles. Being unable to clearly distinguish between speaker faults and measurement errors, we prefer not to report on measurements of high frequency response at this time. We expect to employ the Altec 21B microphone in the future for high frequency measurements, but even this is limited to 10-12 kc unless individually calibrated.

The G-R sound level meter is only rated down to 40 cycles. It is possible that some errors are introduced into our response curves below that frequency, but since the same meter is used on all speakers, a fair comparison can be made.

2) Harmonic Distortion: We consider this test the most informative single measurement we can make on a speaker system. It shows, clearly and unequivocally, how well the enclosure couples the speaker to the atmosphere at low frequencies. It also shows up any distortions introduced by speaker or cabinet resonances. The correlation between this test and listening judgments is fairly good; certainly it is better than the frequency response test. Nevertheless, it must be interpreted carefully if one is not to be misled.

A Heathkit HD-1 Distortion Analyzer is connected across the output of the sound level meter. An oscilloscope is also used at this point to monitor the waveform. The total harmonic distortion is measured at each frequency for which a response reading is taken. The Heathkit meter is able to measure distortions as low as 0.2% or better, so we consider it completely reliable for loudspeaker measurements where distortions rarely go below 1%.

3) Low Frequency Performance. This test dramatically demonstrates a speaker's ability to reproduce low frequencies. It is especially good for comparing several systems.

The sound level meter is set up 6 feet in front of the speaker. Sufficient power is supplied to the speaker at a low frequency (such as 30 cycles) to produce a 75 db sound level. The waveform of the sound level meter output is observed on the oscilloscope and photographed. The amount of power supplied to the speaker is also recorded. Most speakers will show at least a trace of fundamental at 30 cycles, although it is rare that the distortion does not exceed 80%. Of course, smaller speaker systems should be tested at a higher frequency, such as 40 or 50 cycles.

4) White Noise. This is actually a listening test, not easy to reduce to numbers. White noise is noise having uniform energy content per cycle of bandwidth. Interstation hiss on an FM tuner is a good example. When this type of signal is fed to a speaker it should sound like a smooth hiss. Any resonance or response peak will cause a definite tone to be audible, Although this test depends on the listener's judgment for a final evaluation, it is highly esteemed by several authorities. We used it in A-B comparisons of several speaker systems, and could clearly detect differences between them which were easily correlated with our response measurements.

We also used white noise as a convenient measure of the relative efficiency of the speaker systems under test. A constant electrical input of 0.1 watt (RMS) of white noise was fed to each speaker and the overall sound level at a 6 foot distance was measured. This is an excellent and sensitive indication of a speaker's efficiency in converting electrical energy to acoustic energy.

5) Speaker Damping. This test is one used by G. A. Briggs (Wharfedale speakers) and described in his excellent book "Loudspeakers". A battery is connected directly to the speaker voice coil, and then is removed and the speaker is terminated in a resistance many times larger than its voice coil impedance. An oscilloscope is connected across the voice coil, with its sweep initiated by the application or removal of the battery. A perfectly damped speaker would show a single pulse at either the make or break instant, decaying quickly without overshoot or ringing. When the circuit is closed, the speaker is driven from a very low impedance (the internal impedance of the battery). When the circuit is opened, it is terminated in a high impedance and the ringing is usually more pronounced.

In practise, most speakers will ring, or oscillate for one or more cycles, at their resonant frequency or frequencies. The actual electrical amplitude of this oscillation cannot be used directly to compare one speaker with another, since the voice coil impedance and speaker efficiency must both be considered in determining the significance of the ringing of a given speaker. For a given speaker, this technique is valuable in adjusting or selecting an enclosure, since the enclosure giving the smallest amplitude and fastest decay time will generally be the best for that particular speaker.

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Qualitatively speaking, however, we would like to see the speaker ringing be as low in amplitude and frequency and as short in duration as possible. We have not found a consistent correlation between the ringing characteristics and the sound of a speaker, except that a very poor ringing characteristic usually means a poor system. Only one speaker system we have tested has shown an essentially perfect damping characteristic. It will be reported on in a future issue.

By means of an oscilloscope camera, we photograph the ringing characteristics of the speakers we test. The photographs (or accurate tracings of them) are reproduced in our reports.

6) Impedance Response. An audio oscillator is connected through a large series resistor (e.g., 10000 ohms) to the speaker terminals. A vacuum-tube voltmeter (Hewlett-Packard 400-C or Ballantine 310) is connected across the speaker terminals.

Initially, a resistor having the nominal impedance of the speaker (8 ohms, etc.) is substituted and the oscillator level adjusted to develop 8 millivolts (for an 8-ohm speaker) across the load. When the speaker is reconnected, the meter reading in millivolts is numerically equal to the speaker impedance in ohms.

An oscilloscope (Dumont 304A) is utilized to observe the phase relationship between the speaker and oscillator voltages. When they are in phase, we know there is a resonance in the speaker system. These resonances do not necessarily coincide with impedance peaks. All resonant points are noted on the impedance response curve, which is plotted over a wide range of frequencies.

Since we are more interested in the relative variation of impedance rather than its absolute value, the ohmic values are converted to a logarithmic scale and plotted as "db relative to nominal value". For example, for a 16-ohm speaker, 16 ohms is called "0 db". If the impedance should rise to 32 ohms or fall to 8 ohms, these would be plotted as plus or minus 3 db, respectively.

There is no clear relationship between the amplitude of an impedance peak and the acoustic output at that frequency. In general, though, a rise of impedance at a resonance will be accompanied by a rise in acoustic output. The frequency of the lowest major resonance of a speaker system is indicative of the low frequency limit of its performance, but only in a general way. Its response may fall off at a fast or slow rate below resonance, or may already be well on its way down at the resonant frequency.

7) Listening Tests. As we have stated, this is by far the most important test of speaker performance. It is used in home music systems, in a number of different living rooms, and with different types of associated equipment. It is lived with. Our staff members and their families listen to a great variety of program material, over a period of weeks or months. It is compared, side by side, in each of the living rooms, in A-B tests with other speaker systems. Friends, neighbors, and interested audiophiles are invited to listen to the A-B comparisons and to express their opinions. Professional or competent amateur musicians are asked their opinions of the speaker's sound. Occasionally it is possible to actually compare the reproduction with live music of the same type. Our more or less regular listening panel attends at least one evening at each of the houses where such tests are conducted. Two to four hours are spent listening to different program material in an A-B fashion. Each of the panel expresses his particular feelings and the rest of the panel discusses the validity of that expression. Usually a particular point will be "proved" with only a certain type of program material and will not be valid with others.

From all of this, it is usually possible to form some opinions as to the merits of a given speaker system. Rarely (in fact, never) is there unanimity of opinion. We try to summarize the impressions our listeners receive, and whenever possible, to relate them to our measurements. Sometimes there is an obvious explanation for the way a speaker sounds; sometimes there seems to be none at all.

In all cases, the judgment of the listeners is the deciding factor in our speaker ratings. If it agrees with our laboratory findings, well and good. If not, obviously the lab. tests do not tell the whole story. Some speakers show up disappointingly on our measurements, yet sound quite pleasing. We don't know the reason, but it would be misleading and improper for us to state that a certain speaker is no good because of its measured performance, when in fact a majority of listeners find it satisfactory. After all, a speaker system is meant to be listened to, not measured.

When a number of our readers write us of their experiences with a particular speaker (or any other item, for that matter), these too are given due consideration in preparing our reports.

THE REL PRECEDENT FM TUNER

Radio Engineering Laboratories, Inc. (REL) pioneered FM reception, having built some of the first receiving equipment used by Major Armstrong in the mid-thirties. REL equipment has, for many years, been standard for professional applications, such as FM radio relay work, etc. In 1946 their model 646 FM receiver made its appearance and a few deluxe home installations incorporated it, despite its rather high price ($360.).

An improved model, the 646-B, appeared in 1949 and soon earned a reputation for being the finest FM receiver available. In 1954, the 646-C or "Precedent" was announced. It was radically different in physical form and circuitry from its predecessors. REL stated that the performance set a new high. Its price was $325., still leading the field. Its styling left no doubt that it was aimed at the home market.

REL loaned us a Precedent, which we used for several months. It was used in several locations, and was critically compared in A-B tests with several other fine tuners and few which were not so fine.

We are convinced from our measurements (see the technical section of this report for details) that the Precedent lives up to all its advertised claims in full measure. It is unquestionably the most sensitive FM receiver on the market. Its stability and ease of tuning are outstanding. Its residual distortions (which we did not attempt to measure) are obviously extremely low, since the audio quality has that ease and lack of strain which are associated with low distortion systems.

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It might seem as though this paragon among receivers (which it truly is) should be the obvious choice for anyone desiring the ultimate in FM reception. However, nothing is perfect, not even the REL Precedent. It is physically large (15-5/8"W x 5-7/8"H x 12½"D) and weighs 16 lbs. It is expensive. It is too sensitive for many urban and suburban locations.

The latter is possibly the only real weakness of this remarkable receiver. A strong signal can overload it, with the result that the signal may appear at several points on the dial. A sensitivity control is provided to reduce the strength of such signals, but we found that even at its minimum setting, the dial was cluttered with spurious responses.

REL recommends using attenuators in the antenna lead to reduce signal strength, or better yet, using a short piece of wire as an antenna instead of the usual outside FM dipole. This does the job, but we wonder how many people would care to pay $325. for the most sensitive FM receiver made and then throw away most of that sensitivity? The apartment dweller or anyone unable to use an outside antenna will certainly find this set a boon, however. In Pleasantville, 35 air miles from New York City, we found that one foot of antenna wire picked up ten or a dozen stations, fully limiting. No other receiver would get more than one or two stations under these conditions. The shielding of the Precedent is so thorough that, with the antenna disconnected, no trace of a signal can be heard.

In a fringe area, especially when a good antenna is used, this set will have no serious competition. Other sets will pick up extremely weak signals almost as well as the Precedent, but none will limit so rapidly or produce such a quiet distortion-free signal under these conditions.

In one listening location, 25 miles from New York, an indoor folded dipole brought in 29 separate fully limiting stations on the REL (plus a large number of spurious signals). Two other fine tuners were set up, side by side with it, and compared to it, using the same antenna set-up. 22 stations was the best they could do - but neither had any spurious responses.

While its selectivity is good, the REL does not have the extreme adjacent-channel selectivity of the Scott or National tuners. We encountered no difficulty rejecting our most troublesome interfering stations, however.

In A-B listening comparisons, only the slightest differences could be discerned between the REL and the Scott 310A and National Criterion. No difference could be heard between it and the Fisher 70RT and Craftsmen C-10. Even in the former cases, we could not state that the REL was better or worse than the other sets - it was merely different. Possibly slight differences in the de-emphasis characteristics of the several tuners were responsible for the audible differences. When compared to several inexpensive tuners (under $90.), the Precedent was outstanding. It showed much better bass response in particular, plus an overall smoothness not found in the cheaper tuners. After all, it would be unreasonable to expect a $90. tuner to sound as well as a $325. tuner, and it doesn't.

Our conclusion from this is that the distortions generated in broadcasting a program (live, by the way) and in the reproducing system (using some of the finest speakers and amplifiers available) are substantially greater than those inherent in any of the better quality FM tuners. Therefore, in a practical home situation, one should not expect one good tuner to sound significantly better than another. Of course, in FM relay work, where a signal is passed through as many as a dozen receivers in succession, each must have its distortions reduced to an absolute minimum. The universal acceptance of REL tuners in this application tells its own story.

The Precedent is built with special attention paid to obtaining adequate cooling for its 15 tubes. Everything is operated conservatively and one should expect long, reliable service from this set. Mechanically, it is built with precision. Everything works smoothly, particularly the bead-chain drive for the tuning system. There is evidence of the finest hand workmanship in this set, as contrasted to the assembly-line methods usually employed.

Its appearance is rather elegant, with the entire panel glowing a soft golden color in a darkened room. The letters PRECEDENT (illuminated) are a trifle too prominent - rather like putting a lighted sign on a Rolls-Royce.

Controls are: RF gain, tuning, audio gain/power switch. Two meters serve as signal strength and tuning indicators.

The antenna plug (not made by REL) is a shoddy affair, with set screws which strip their threads with the greatest of ease. REL uses this type of plug because it requires no soldering It is the only part of the Precedent not up to its high standard. Fortunately it is a minor item and if the antenna is once installed and not changed frequently (as ours was) there should be no trouble from this source.

TECHNICAL REPORT

The Precedent has a cascode R.F. amplifier, triode mixer, 5 IF amplifiers, and 5 limiters, plus 8 crystal diodes used in conjunction with the vacuum tube limiters. Two crystal diodes are used in the discriminator circuit, followed by a two-stage audio amplifier and cathode follower output stage.

Slug tuning is employed. Five slugs are ganged and tracked, no small achievement in itself. As might be expected, the limiting characteristic is fantastically good. REL claims 2 uv on the 75 ohm input (or 4 uv on the 300 ohm input) will produce 40 db of quieting. We found that 3.4 uv gave 35 db signal/noise ratio, and that this was at a knee of the quieting curve (Fig. 1). The difference between the 35 and 40 db quieting could well be experimental error. Note that 1.7 uv gives a 20 db S/N ratio. These are "hard" microvolts (see Vol. 1, No. 3 of the Reports, page 2). If rated as most manufacturers do, this set could be said to have 0.85 uv sensitivity for 20 db quieting, or 1.3 uv for 30 db quieting.

Discriminator bandwidth was in excess of 650 kc. IF selectivity was not measured, but comparisons with the National Criterion and Scott 310 tuners indicated that they had somewhat better skirt selectivity than the REL.

The Precedent was good but not perfect in rejection of ignition noise. It was at least as good as any other set tested at that time.

Its capture ratio was even better than that of the Scott, its closest rival. This is not surprising in view of the array of limiters employed in the REL.

The dial is open, easy to read, and well calibrated. Our test receiver was within plus or minus 200 kc over the entire band.

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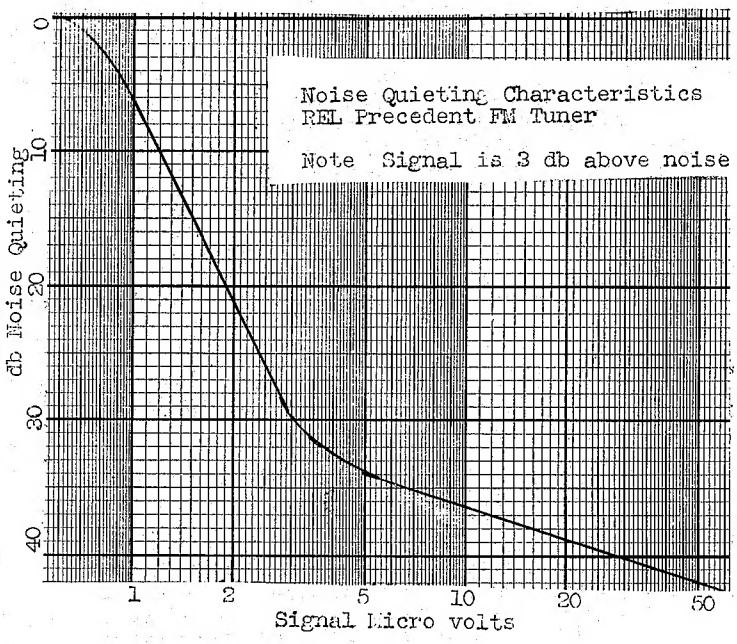

SUMMARY

The REL Precedent is foremost in sensitivity and capture ratio, and possibly in stability and low distortion. It is built and designed conservatively, for long and trouble-free life.

Its only serious drawback is a tendency toward spurious responses on strong signals which can be eliminated by doing away with an antenna if necessary. This could be a pleasure.

Its sound quality is as good as can probably be obtained at this time, but not significantly better than a number of other good FM tuners. It is expensive and relatively bulky. It is beautiful.

A Precedent is an obvious choice for extreme fringe area reception, where it should be without equal. Elsewhere, it has undeniable prestige value. If money is no object, one can have an FM receiver capable of the highest performance possible at the present state of the art, and not likely to be obsoleted or significantly improved upon.

THE AUDIO LEAGUE
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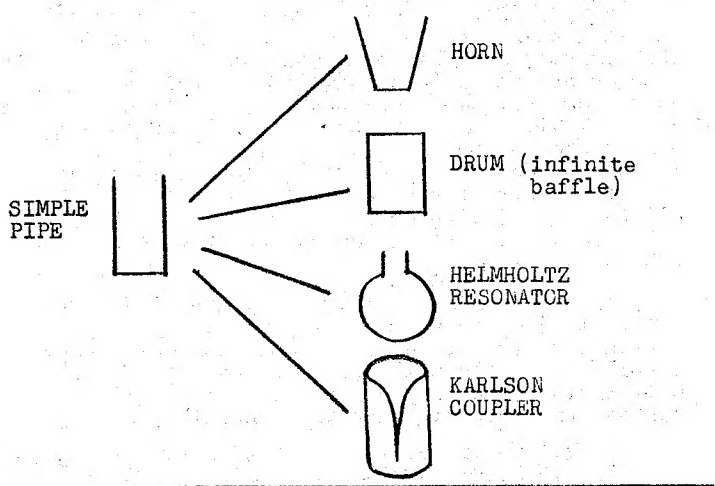
"Since this is such a new development in acoustics, many of the engineering concepts and measurement techniques are not likely to be clearly understood even by experts in the field. As a consequence, we have been deluged with mail for explanations of every detail of this development. In order to handle this demand, we have issued free booklets containing our latest information on the subject, and have revised this publication as necessary. We now have a third edition under way, which contains still more technical information and also discusses our new developments in aural optics. Descriptions of the Karlson 12 inch and Karlson 8 inch enclosures will also be included in this booklet. They may be obtained, when available, by sending your requests to Karlson Associates, Inc., 1610 Neck Road, Brooklyn, N. Y.

Yours very truly,
KARLSON ASSOCIATES, INC.
(sgnd) John E. Karlson
President"



★★ IN CURRENT MAGAZINES ★★

We want to thank HIGH FIDELITY for their very nice plug for us, (HELP NEEDED, page 35) in the Noted With Interest column of the October issue. We do need help and we appreciate their interest in us (only wish they'd seen our ad on page 158 increasing our rates). Incidentally, have you noticed how closely most of Roy F. Allison's "Tested in the Home" reports coincide with A.L.R. test findings? Wish everybody was nice as Electro-Sonic Labs. (see page 143) - but then not everyone can be the "finest", Consumers Union notwithstanding. We will take our Seniors (by at least a million circulation and 20 years) to task next issue.

EXPIRATION DATES AND CODE NUMBERS EXPLAINED

If the code number appearing on your stencil is 1X10, your subscription expires with the next issue. If it reads 1X12, your subscription expires with Volume 1, number 12. If it reads 2X3, it expires with Volume 2, number 3. The first number gives the volume of expiration, the second number the issue of that volume. There are 12 issues per volume. The letter (if any) following denotes mail service, F for First Class and A for Air Mail. Life Time subscriptions are sequentially numbered, - LIFE-3-A denotes our third life subscriber and the issues are to be air-mailed.

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